COTTON GROWTH AND DEVELOPMENT AFTER APPLICATION OF ENVOKE (TRIFLOXYSULFURON) IN COTTON

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RESEARCH PROBLEM

Cotton injury has been a concern in Arkansas with the herbicide Envoke™ (trifloxysulfuron or CGA-362622). In 40 Arkansas field experiments, injury from Envoke ranged from 0 to as much as 70%. Although visual injury is usually transient and yields have not been reduced (Porterfield et al., 2002 and 2003), Arkansas weed scientists are attempting to characterize injury and define conditions under which injury from Envoke can occur. As has been evident with glyphosate, visual injury and effects on cotton development are not always correlated (Barrentine et al., 2001). Characterization of effects of Envoke on cotton growth and development is important to determine whether the injury we have observed may be affecting growth and development parameters. The objective of this study was to evaluate effects of Envoke on visual cotton response and on growth and development using COTMAN, the decision-aid program (Danforth and O’Leary, 1998).

BACKGROUND INFORMATION

Envoke is a sulfonylurea herbicide developed for post-emergence over-the-top or post-directed applications in conventional or transgenic (Roundup Ready® or BXN™) cotton. It is also formulated with prometryn as the premixture Suprend™ for post-directed application. Envoke controls several economically important weeds in cotton, including morningglory (Ipomoea) species, non-ALS-resistant pigweed (Amaranthus) species, hemp sesbania (Sesbania exaltata), sicklepod (Senna obtusifolia), and purple and yellow nutsedge (Cyperus species) at very low use rates ranging from 0.1 to 0.25 oz/acre (Branson et al., 2002; Porterfield et al., 2003; Wells, 2000). It has soil-residual activity that can be an advantage in transgenic cotton programs. Envoke also has pre-emergence activity, but injury has been a concern (up to 49% injury) (Branson et al., 2002), and it is not labeled for pre-emergence use in cotton. Injury is usually manifested as chlorosis and stunting, but conditions under which injury occurs have not been defined.

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RESEARCH DESCRIPTION

An experiment was conducted in 2003 at Marianna, Arkansas, on a silt loam soil. The experimental design was a randomized complete block with four replications and 13- by 40-ft plots. Paymaster 1218BR cotton was planted June 3. Plots were maintained weed-free and were furrow-irrigated as needed. Treatments included Sequence (glyphosate plus metolachlor) applied over-the-top (OT) to 2- to 3-leaf cotton followed by (fb) Envoke OT at 0.004 and 0.007 lb ai/A to 8-leaf cotton fb Suprend (prometryn plus trifloxsulfuron) at 1 lb ai/A post-directed (DIR) to 12-leaf cotton; Sequence (2- to 3-leaf cotton) fb Envoke at 0.004 lb/A (8-leaf) fb 0.007 lb/A (12-leaf); Roundup WeatherMax (glyphosate), 0.75 lb ae/A OT to 2- to 3-leaf cotton fb Roundup WeatherMax 0.75 lb/A DIR (8-leaf) fb Caparol (prometryn) plus MSMA or Valor (flumioxazin) plus MSMA (12-leaf); and Staple (pyrithiobac) at 0.031 lb ai/A plus Roundup WeatherMax (2- to 3-leaf) fb Valor plus MSMA (12-leaf). Herbicides were applied in 20 GPA output volume. Treatments at 2- to 3-leaf cotton were applied June 16, 8-leaf treatments were applied July 7, and 12-leaf treatments were applied July 22. Data collected included visual cotton injury ratings, COTMAN data, end-of-season mapping, and cotton yield. Data were analyzed by analysis of variance, and means were separated with LSD at P=0.05.

RESULTS AND DISCUSSION

Envoke caused moderate cotton injury (24 to 30%), primarily in the form of stunting, after the 8-leaf application, compared to untreated and glyphosate-treated cotton. Plants were still stunted (9 to 14%) when post-directed treatments were applied. Seedcotton yield, however, was not reduced.

The number of squaring sympodia at first flower (8.3 to 8.8) and the number of sympodia with retained first-position squares at first flower (6.8 to 7.2) were not affected by herbicide treatment. Cotton plants treated with Envoke were significantly shorter at first flower than cotton treated with Roundup WeatherMax or Staple plus Roundup WeatherMax (average of 27.2 for Envoke treatments and 30.4 inches for other treatments). Envoke also caused small reductions in height-to-node ratios (HNR), indicating that internode growth was impacted by the herbicide. The HNR parameter determined by COTMAN correlated to visual injury observed in the field. Although growth and fruiting patterns were not impacted by Envoke treatments (Fig. 1.), Envoke followed by Envoke or Envoke plus Caparol caused a 2- to 4-day delay in maturity compared to untreated cotton. End-of-season mapping indicated that herbicide treatment did not affect percent retention of first- or second-position bolls on nodes one through ten, number of outer bolls, number of sympodial branches, or final plant height.
PRACTICAL APPLICATION

Although cotton injury can appear significant after over-the-top post-emergence application of Envoke, cotton growth and development may not be affected enough to reduce cotton yield. The only parameter measured by COTMAN that reflected the visual injury attributed to Envoke was HNR. COTMAN is a valuable tool for measuring the effects of herbicides on cotton fruiting patterns and for comparing effects among herbicide treatments. However, it cannot substitute for visual injury assessments, which are of realistic concern to cotton producers.

LITERATURE CITED


Fig. 1. Growth patterns for cotton treated with Envoke fb Suprend (EN.004/Sup) or Envoke (EN/EN), Staple + Roundup fb Valor + MSMA (StRU/Val), untreated (Untrt), and target growth-development curve (TDC) at Marianna, Ark., in 2003.